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**Compiled by F. Pentecost**
**Space Sciences Laboratory**

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16. ABSTRACT

This document is a bibliography by year of the research published in the open literature by the workers in the Materials Processing in Space program. This work was sponsored by NASA, either directly or indirectly, and generally pertains to the influence (or lack of influence) of gravity on processes involved in crystal growth, solidification, fluid transport, containerless phenomena, and various separation techniques of interest to the biomedical community. Also included are studies of the possibilities of using the high vacuum in the wake of orbiting vehicles for performing processes involving large heat loads and evolution of gases.

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## FOREWORD

This document is a bibliography by year of the research published in the open literature by the workers in the Materials Processing in Space program. (Also included are a listing of submitted papers for which acceptance is pending and an appendix which provides a complete listing of the bibliography arranged alphabetically.) This work was sponsored by NASA, either directly or indirectly, and generally pertains to the influence (or lack of influence) of gravity on processes involved in crystal growth, solidification, fluid transport, containerless phenomena, and various separation techniques of interest to the biomedical community. Also included are studies of the possibilities of using the high vacuum in the wake of orbiting vehicles for performing processes involving large heat loads and evolution of gases.

The research reported in this document has a widely varying scope. For the most part, it represents ground-based studies aimed at exploring the role of gravity in a process, how to control its effects, and the determination of the limitations of ground-based techniques. It is anticipated that flight experiments will evolve naturally from this type of research. In cases where a clear rationale for space experiments has been perceived and the experiment is under development, much ancillary work is required to assure the success of the experiment. Often this work is of sufficient interest to merit publication in the open literature. Finally, work actually done in low gravity, either in early spaceflight experiments, current rocket flights, or in drop towers, drop tubes, and aircraft flying ballistic trajectories, is reported.

It is particularly noteworthy that the number of open literature publications produced by the program has increased dramatically in recent years. This reflects the emphasis on science recommended by the National Academy of Science (STAMPS Report*) and the philosophy of the present program administration.

Robert J. Naumann
Program Scientist

* Materials Processing in Space, Committee on Scientific and Technological Aspects of Materials Processing in Space (STAMPS), National Academy of Science, 1978.

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# SUBMITTED ARTICLES

The following articles have been submitted to journals. Acceptance is pending.

Bourret, E. D., Favier, J. J., and Witt, A. F., "Theoretical Analysis of Directional Melting," submitted to Journal of Crystal Growth.

Chang, C. J. and Brown, R. A., "Finite Element Calculation of Natural Convection During Steady Solidification," submitted to International Journal of Numerical Methods in Fluids.

Chang, C. J. and Brown, R. A., "Radial Segregation Induced by Natural Convection and Melt/Solid Interface Curvature in Melt Crystal Growth," submitted to Journal of Crystal Growth.

Choudhary, M. and Szekely, J., "The Effect of Temperature Dependent Electrical Conductivity on Flow and Temperature Fields in Slags in ESR Systems," submitted to Met. Trans.

Clark, I. O., Fripp, A. L., et al., "Solutal Diffusion Coefficient for Liquid PbTe-SnTe," submitted to Journal of Electrochemical Society.

Ettouney, H. M. and Brown, R. A., "Finite Element Methods for Steady Solidification Problems," submitted to Journal of Composite Physics.

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Larson, D. J., Pirich, R. G., et al., "Convective Influence of Off-Eutectic Plane Front Solidification of Bi/MnBi," to be submitted to Journal of Crystal Growth.

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# APPENDIX

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APPROVAL

MATERIALS PROCESSING IN SPACE: A SURVEY
OF REFEREED OPEN LITERATURE PUBLICATIONS

Compiled by E. Pentecost

The information in this report has been reviewed for technical content. Review of any information concerning Department of Defense or nuclear energy activities or programs has been made by the MSFC Security Classification Officer. This report, in its entirety, has been determined to be unclassified.

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